

REMARKS

Applicant respectfully requests favorable reconsideration and allowance of this application in view of the foregoing amendments and the following remarks.

Claims 1, 3 through 15, and 17 through 41 are pending, with Claims 1, 15, 33, 35, and 41 being independent.

Claim 41 has been added. Applicant submits that support for the new claim can be found in the original disclosure, and therefore no new matter has been added.

Applicant appreciates the courtesies extended by Examiner Vanore and his supervisor, Examiner Lee, in granting and conducting a personal interview with Applicant's representative on September 24, 2003. The remarks below constitute Applicant's summary of the substance of the interview.

First, by way of background, the Examiner's attention is directed to the attached excerpt of CANON TV OPTICS II (Sections 2.2, 2.13, & 2.14), which were presented at the interview. As explained at the interview and illustrated in the figures of the excerpt, a lack of focus in an image results from a misalignment of an image along the direction of an optical axis (i.e., the imaging surface or plane is not placed at the point of focus). On the other hand, Seidel's aberrations include spherical aberration, coma, astigmatism, curvature of field, and distortion. In particular, image distortion is caused by misalignment of an image-forming location in a direction perpendicular to the optical axis.

As recited in independent Claim 1, the present invention is directed to a projection apparatus for projecting a mask pattern onto a substrate using a charged particle beam. In such an apparatus, image distortion is one of the main factors of off-axis aberrations, as

discussed for example at page 18, lines 14-22. The present invention of Claim 1 corrects image distortion using a magnetic lens of a projection optical system.

More specifically, as recited in Claim 1 the present invention includes, *inter alia*, the features of a projection optical system including a first unit having first and second magnetic lenses, and a controller arranged to move a principal plane of the first unit in a direction of an optical axis so that an image distortion is corrected, wherein the controller changes an on-axis distribution of a magnetic field generated by the first unit to move the principal plane by changing a ratio of currents to be respectively supplied to the first and second magnetic lenses. Applicant submits that the cited art fails to disclose or suggest at least these features.

Claims 1 through 11, 15 through 25, and 29 through 40 stand rejected under 35 U.S.C. § 102(e) over U.S. Patent No. 6,225,637 B1 (Terashima, et al.). The dependent claims variously stand rejected under 35 U.S.C. § 103 over Terashima, et al. in view of either U.S. Patent No. 4,954,717 (Sakamoto, et al.) alone or in further combination with U.S. Patent No. 4,469,949 (Mori, et al.). These rejections are respectfully traversed.

As pointed out during the interview, Terashima, et al. includes a reduction optical system 8 that includes magnetic lenses. However, that patent also includes a separate aberration correction optical system 7. In the outstanding Office Action, the portions of Terashima, et al. that the Examiner cited as allegedly disclosing the claimed controller (i.e., Col. 13, lines 35-45) refer to control of system 7. However, that system uses a unipotential lens (i.e., an electrostatic lens) rather than a magnetic lens, as the Examiner agreed at the interview.

Accordingly, Applicant submits that Terashima, et al. fails to disclose or suggest at least the feature of a controller arranged to move a principal plane of a first unit having first and second magnetic lenses so that an image distortion is corrected. That patent further fails to disclose or suggest at least the feature wherein the controller changes an on-axis distribution of a magnetic field generated by the first unit to move the principal plane of the first unit by changing a ratio of currents to be respectively supplied to first and second magnetic lenses. The other cited art does not remedy these deficiencies of Terashima, et al. Therefore, Applicant submits that Claim 1 is patentable over the cited art, whether that art is considered individually or taken in combination.

Claim 15 is a method claim having method steps corresponding to the elements of Claim 1. That claim is believed patentable for at least the same reasons as Claim 1.

Claim 33 recites, among others, the features of a projection optical system which has a magnetic lens, and a controller arranged to move a principal plane of the magnetic lens in a direction of an axis of the projection optical system to adjust an image distortion of the projection optical system, wherein the controller changes an on-axis distribution of a magnetic field generated by the magnetic lens to move the principal plane of the magnetic lens by controlling a current to be supplied to the magnetic lens. Applicant submits that the cited art fails to disclose or suggest at least these features for the reasons discussed above.

Claim 35 recites, among others, the features of a projection optical system including a first unit having first and second magnetic lenses, and a controller arranged to change a ratio of currents to be respectively supplied to the first and second magnetic lenses to move a first principal plane of the first unit in a direction of the optical axis of the

projection optical system. Applicant submits that the cited art fails to disclose or suggest at least these features for the reasons discussed above.

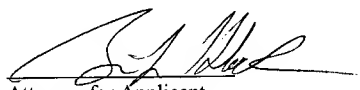
New Claim 41 recites features similar to Claim 33, and is believed patentable for similar reasons.

The dependent claims are also submitted to be patentable because they set forth additional aspects of the present invention and are dependent from independent claims discussed above. Therefore, separate and individual consideration of each dependent claim is respectfully requested.

In view of the foregoing, Applicant submits that this application is in condition for allowance, and a Notice of Allowance is respectfully requested.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,



Attorney for Applicant
Brian L. Klock
Registration No. 36,570

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200
BLK

DC_MAIN 145179v1